Abstract

Title: EEG analysis of gait on an unstable surface

Objectives: The aim of the thesis was comparison of changes of electrical activity of intercerebral brain structures using the programme sLORETA between 1) the state of rest and walk on slackline, 2) the state of rest and walk on groundline and 3) between the state of rest and projection of first-person virtual reality of walking on slackline; to find out which intracerebral areas are activated during these activities**.**

Methods: 10 healthy participants took part in the test, 6 males and 4 females, between 18 and 30 years of age, 24 years of age on average. The experiment consisted of EEG gauging at rest with open/closed eyes (5 minutes each) and three other consequent parts in random order: 1. walk on slackline (2 minutes), 2. walk on groundline imitating walk on slackline (2 minutes), 3. watching a video with the first-person virtual reality projection of walking on slackline in basic position (2 minutes). During the whole experiment the brain activity was monitored and recorded by Wireless EEG Nicolet, EEG hat Waveguard Connect with 19 electrodes was used for collecting data by scalp EEG. The record was consequently assessed by sLORETA programme which created projection of active brain parts in 3D Talairach atlas.

Results: Statistically significant difference in comparison of all three pair groups was detected. Comparison of walking on slackline and the state of rest and comparison of walking on groundline and the state of rest detected the activity of centres for processing visual information (BA 17, 18, 19, 20, 21), centres for movement control and for new information memory deposition (BA 10, 11) and emotion centres (BA 37, 39) which implies potential use of these activies for activating the centres. Comparison of virtual reality projection with the state of rest proved activation of centres for visual processing and spatial memory (BA 20, 21, 38, 42). It is possible to assume that virtual reality along with physical exercise can be used for activating relevant centres of cerebral cortex. As for the areas related to presence of mirror neurons, centres in pre-frontal area and temporal lobe were activated (BA 10, 11, 20) during observing movement by means of virtual reality and also then performing movement actively which indicates potential involvement of mirror neurons while walking on unstable surface (i.e. slackline). These results and following research could be applied in the field of neurorehabilitation and sport branch.